Chapter 12
Urban Water Use

Historically, urban demands have been a small percentage of total water demand in the Sacramento Valley, and much of that demand has been met through groundwater pumping. Compared to agriculture, urban water purveyors have used relatively small amounts of surface water. However, land-use projections from DWR's Division of Statewide Integrated Water Management (DSIWM) predict significant urban growth during the next 20 years. Some projections show that most of this urban development will take place on agricultural lands and that land-use conversion may have considerable impacts on both surface water and groundwater use. The anticipation of land-use changes and growing urban demands requires a more refined assessment and representation of urban water use in CalSim 3.0 than has previously been developed.

This chapter describes the development of urban demands and simulation of municipal and industrial (M&I) water use for each of the urban demand units discussed in Chapter 3 (Demand Units). For calculation of water demands, demand units are disaggregated into populations served by public agencies and populations whose water supplies are self-produced. "Public" water demands are based on recently published production data, whereas "self-produced" water demands are calculated from population estimates and representative per capita water use.

Representation in CalSim 3.0

The following sections describe how CalSim 3.0 simulates urban water use. A standardized template is used to represent the flow of water to and from urban lands. Water use parameters determine associated conveyance and treatment losses, reuse of treated wastewater, and volume of return flows.

Urban Template

Each demand unit in CalSim 3.0 receives water from a network of arcs built on standard templates for representing agricultural, urban, and wetland water use. Figure 12-1 presents the template for urban demand units. Water delivery arcs to urban demand units and return flow arcs from these demand units to the stream system are represented in the CalSim 3.0 schematic. In Figure 12-1, these arcs have an associated label in the center of a box placed at mid-span. The convention for naming such arcs is described in Chapter 4 (Network Schematic). Additional subarcs, defined within the CalSim 3.0 Water Resources Simulation Language (WRESL) code, represent water use within the demand unit in more detail. These subarcs, which are omitted from the CalSim 3.0 schematic, are listed in Table 12-1.

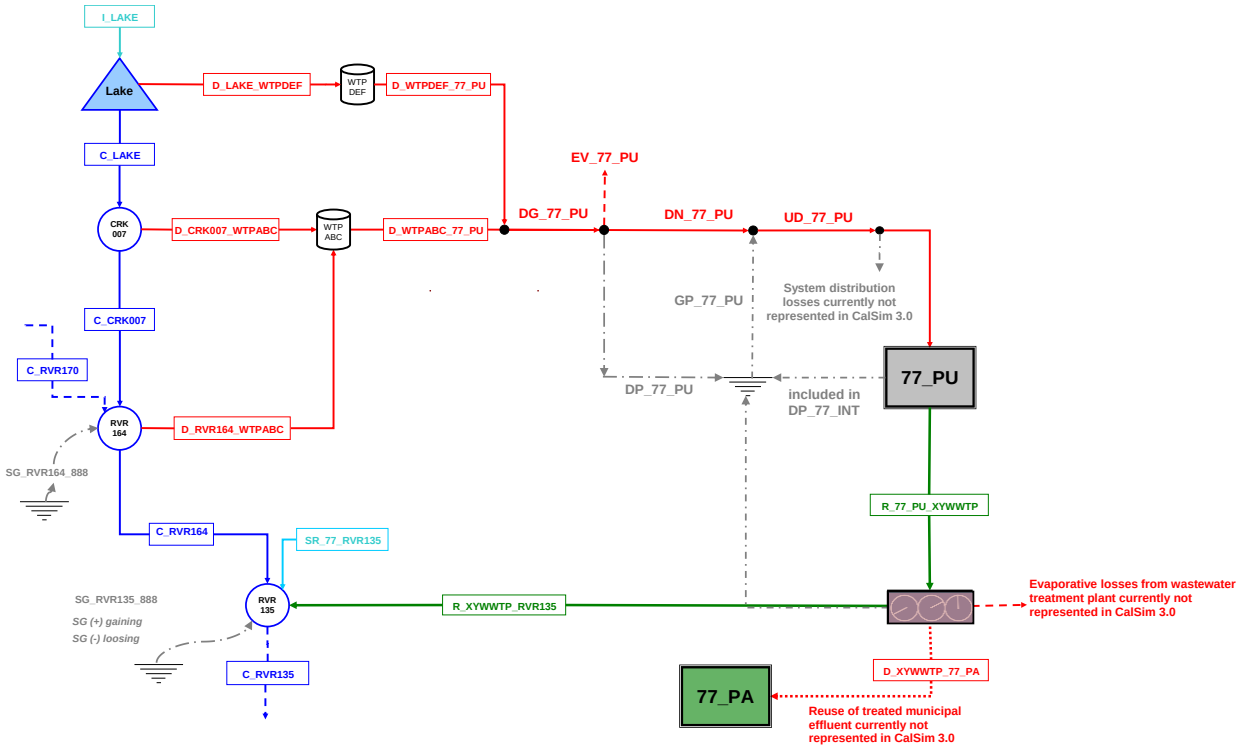

Figure 12-1. CalSim 3.0 Urban Diversion and Return Flow Arcs

Table 12-1. Flow Paths for Urban Water Use

Arc Prefix	Name	Description
DG_	Diversion Gross	The sum of all surface water diversions from the stream or canal system to the water treatment plant or directly to the demand unit in cases where the water treatment plant is not explicitly represented in the CalSim 3.0 schematic.
DN_	Diversion Net	Net surface water production after accounting for all raw water conveyance and treatment losses.
EV_	Evaporation Loss	Evaporative loss associated with raw water conveyance system and treatment.
DP_	Deep Percolation Loss	Seepage loss associated with raw water conveyance and treatment.
GP_	Groundwater Pumping	Groundwater pumping (not subject to raw water conveyance and treatment losses).
UD_	Urban Demand	Urban demand at the water treatment plant or groundwater well head. Corresponds to water production. Includes transmission and distribution losses downstream from the treatment facility.
R_	Return Flow	Treated wastewater return flow to the surface water system.

Urban Water Use Parameters

The CalSim 3.0 template for urban water use is simpler than its agricultural equivalent. Most urban demands (prefix UD_) in CalSim 3.0 are based on water production data from public water agencies. These demands include transmission and distribution losses, and therefore are greater than water use by the customer or end user. Urban demands must be met from either surface water or groundwater, or a combination of both sources. Losses associated with the conveyance of surface water from the point of diversion to the water treatment plant, and associated with the treatment process are divided into evaporative losses (prefix EV_) and deep percolation losses (prefix DP_) to groundwater.[1] Water losses downstream from the water treatment plant or downstream from groundwater wells are caused by leakage from the transmission and distribution mains, leakage and overflows from utility storage tanks, and leakage between the mains and service connections. These losses are currently not represented explicitly in CalSim 3.0 and are included as part of the urban demand.

Downstream from the transmission and distribution system, water use is implicitly divided into indoor and outdoor water use. All indoor water returns to a wastewater treatment plant (or septic system for smaller communities). Treated wastewater is removed through spray irrigation and evaporation, percolation to groundwater from holding lagoons, or discharged to streams and rivers. Arcs representing discharge of treated wastewater to the stream system have a prefix R_. Outdoor water is consumed through evaporation and evapotranspiration (ET) or percolates to groundwater (arc DP_77_INT in Figure 12-1). It is assumed that there is no surface water return flow from outdoor water use.

Demand Units

Urban demand units are listed in Chapter 3. CalSim 3.0 represents 64 urban demand units located in Water Budget Areas (WBA) within the Sacramento Valley. Of the 64 urban demand units, 31 receive all, or part, of their water supply from surface water. The model represents 12 additional urban demands outside the WBA domain that receive surface water from rim watersheds of the Sacramento Valley or from canal systems on the valley floor. For example, the City of Fairfield, which is located to the west of the Sacramento Valley WBAs, receives water from the Putah South Canal.

Data Sources

Primary data sources for determining urban water demands are described in the following sections.

Division of Statewide Integrated Water Management

DSIWM planning activities include measurement, collection, and evaluation of urban water use data. These data are summarized in the *California Water Plan* (Bulletin 160-09 series), and in periodic reports on urban water use (Bulletin 166 series) and industrial water use (Bulletin 124 series) (DWR, 1994, 1982). The following water use data are available for water years 1998 through 2003 (DWR, 2011):

[1] These losses are currently removed downstream from the arc leaving the water treatment plant.

- Population by Detailed Analysis Unit (DAU)
- Percentage water use by customer class (residential, manufacturing, commercial, industrial, large landscape)
- Indoor-outdoor split for residential and commercial sectors
- Source of water (groundwater or surface water)
- Per capita water use

For the *California Water Plan, Update 2005*, DSIWM developed water balances for the entire State for water years 1998, 2000, and 2001. As part of *California Water Plan, Update 2009*, DSIWM standardized the methodology and format of the water balances and produced a set of water balances by DAU for water years 1999 and from 2002 through 2005. As part of *California Water Plan, Update 2013*, the water balances have been extended through 2010.

DSIWM collects water use and population data through its Public Water System Statistics (PWSS) questionnaires, which are mailed annually to public water purveyors. Each public drinking water source has a system identification number and a source number.[2] Data provided in completed PWSS questionnaires include water production, population, metered water deliveries (if metered), and active service connections by customer class. There are six customer classes in the questionnaire: Single-Family Residential, Multi-Family Residential, Commercial, Industrial and Landscape, and Other. "Other" can encompass a range from wholesale water sold to, or purchased from other districts, to fire hydrant use or system flushing. The information contained in the questionnaires is compiled in the PWSS database. Currently, this database contains data through the calendar year 2010. While no accurate map of all sources currently exists, DSIWM has categorized public water sources by county and by DAU (county-DAU). Tables 3-7 and 3-8 in Chapter 3 (Demand Units) present data extracted from the PWSS database for public water agencies serving over 1,000 people. This information is grouped by CalSim 3.0's urban demand units.

Urban Water Management Plans

The Urban Water Management Planning Act was established by Assembly Bill (AB) 797 on September 21, 1983. The law requires municipal water suppliers in California providing water either directly or indirectly to more than 3,000 service connections (customers), or supplying more than 3,000 acre-feet per year of water, to prepare and adopt an Urban Water Management Plan (UWMP).[3] The purpose of the act is to ensure that water suppliers plan for long-term conservation and efficient use of the State's limited water supplies. Two bills, Senate Bill (SB) 610 and SB 221, added new requirements to the act. These bills are intended to improve the link between water supply availability and certain land use decisions made by cities and counties. SB 610 and SB 221 require that counties and cities in California consider the availability of adequate

[2] The identification numbers used in the PWSS are the same as the identification numbers used by the California Department of Public Health (DPH).

[3] California Water Code Division 6, Part 2.6, Urban Water Management Planning, Section 10610 – 10656.

water supplies for certain new large developments. UWMPs are identified as key source documents for this verification. An adopted UWMP must be updated at least once every 5 years on or before December 31.[4] UWMPs are submitted to DWR, and data within the plans are summarized by DSIWM as part of the *California Water Plan*. The 2010 UWMPs are available online (DWR, 2016). A UWMP is required for an urban water supplier to be eligible for water management grants or loans administered by DWR, the State Water Resources Control Board (State Water Board), or the Delta Stewardship Council. A current UWMP must also be maintained by the water supplier throughout the term of any grant or loan administered by DWR.

The Urban Water Management Planning Act requires urban water suppliers to report, describe, and evaluate: water deliveries and uses; water supply sources; efficient water uses, and demand management measures including implementation strategy and schedule. In addition, the Water Conservation Bill of 2009 (SB X7-7) requires urban water suppliers to include in the UWMP base daily per capita water use, an urban water use target, an interim urban water use target, and compliance daily per capita water use.[5]

Water Forum Agreement

The Water Forum is a diverse group of community leaders and water experts who, in 1995, cooperated to devise a plan and subsequent agreement on how to manage water supplies for the region adjacent to the lower American River. Two coequal goals of the Water Forum are to "provide a reliable and safe water supply for the region's economic health and planned development to the year 2030" and to "preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River."[6] To enable the region to achieve its goals, the Water Forum Agreement includes a detailed understanding among stakeholders on how the region will deal with groundwater management, surface water diversions, dry and critical year water supplies, and water conservation goals. All of these activities are balanced with the need to protect the lower American River. Figure 3-5 of Chapter 3 depicts the urban water purveyors within this region. Most of the public water purveyors within CalSim 3.0 WBAs 26N and 26S are signatories of the *Water Forum Agreement of 2000*.

A major source of data for urban water use in the vicinity of the lower American River is an application of the Integrated Groundwater Surface Water Model (IGSM) for Placer, Sacramento, and San Joaquin counties. The model application, originally developed in the early 1990s, has been and continues to be calibrated over time. The most recent calibration run of the IGSM application simulates water years 1969 through 2004. The IGSM application is the cornerstone of the long-term forecast model used by the Water Forum and includes historical groundwater pumping and surface water diversion data. The source of water supply data used as input in the calibrated IGSM model is water purveyor reported data from the water demand analysis completed by Boyle Engineering in 1995, and subsequently updated by WRIME, Inc. (now part

[4] The Urban Water Management Planning Act requires that UWMPs be prepared and submitted in December of years ending in 5 and zero. However, because of recent changes in UWMP requirements, State law extended the deadline for the 2010 Plans to July 1, 2011. Although submitted in 2011, these plans will be referred to as 2010 UWMPs because they include 2010 water data, and to retain consistency with the 5-year submittal cycle.

[5] Senate Bill X7-7 was enacted on November 9, 2009, mandating water conservation targets and efficiency improvements for urban and agricultural water suppliers, respectively

[6] Water Forum Agreement, January 2000.

of RMC Water and Environment) in preparation of groundwater studies completed from 1995 to 2004. These studies were to satisfy California Environmental Quality Act (CEQA) analysis of groundwater movement related to new development and in support of proposed groundwater management programs. Output from the IGSM application includes monthly agricultural and urban water demands, groundwater pumping, surface water diversions, and water imports and exports.

National Census Data

The U.S. Bureau of the Census is responsible for collecting information used to determine the allocation of governmental resources. Every 10 years (in years ending in "0"), the agency is required to mail to each household a questionnaire regarding income, ethnicity, and housing. The household survey information from the decennial census is aggregated to block-level and larger geographical units. Geospatial population data assembled from these surveys are available online (Census, 2012).

National Pollutant Discharge Elimination System

The Clean Water Act (amended in 1977) gives the Federal U.S. Environmental Protection Agency (EPA) authority to implement pollution control programs and to set water quality standards for all contaminants in surface waters. The act requires that dischargers of pollutants from a point source into navigable waters obtain a permit. EPA issues these permits directly under its National Pollutant Discharge Elimination System (NPDES) permit program or delegates the responsibility to individual states. In California, operators of industrial, municipal, and other facilities that discharge directly to surface waters must obtain a permit from the relevant Regional Water Board. Details of specific facilities with NPDES permits are obtainable online (EPA, 2016).

Population Data

As part of the California Water Plan, DSIWM produces annual population estimates for each county-DAU. These estimates are developed as follows:

- Geographic Information System (GIS) data layers of county and DAU boundaries are intersected with census 1990 and 2000 block data to obtain population estimates for these 2 years.

- California Department of Finance estimates are used to define city (incorporated) populations for years subsequent to 2000.

- California Department of Finance estimates are used to define unincorporated populations for each county subsequent to 2000.

- California Department of Finance unincorporated population is disaggregated into county-DAUs based on 1990 to 2000 growth rates for the unincorporated populations using census data. This calculation must account for city annexations and incorporations to obtain a true growth rate for the unincorporated areas.

DSIWM recently revised and extended its population estimates following the release of 2010 census data and subsequent revisions by the California Department of Finance to its population estimates. Table 12-2 presents population data by county and DAU for years 2000 and 2010, and average annual growth rates.

CalSim 3.0 population estimates for each urban demand unit are derived from DSIWM data for 2010. DSIWM population data by county and by DAU for 2010 was mapped to CalSim 3.0 WBAs using Census 2000 population data.[7] This mapping is presented in two different forms. For each WBA, Table 12-3 presents associated county-DAUs, and the percentage of the county-DAU population located in the WBA. Table 12-4 allocates the 2010 county-DAU population to the various WBAs.

Water Demands

As described in Chapter 3, each WBA contains a minimum of one urban demand unit to represent small communities and self-supplied water use. Depending on population centers and distribution, urban demands within a WBA may be disaggregated into additional demand units to account for differences in sources of water, contract types, water rights for surface water diversions, and manner of wastewater treatment and disposal. Urban demand units that embody small scattered communities dependent on groundwater are named "##_NU," where ## refers to the WBA number ID, and the suffix "NU" stands for non-project water users. Other urban demand unit names contain the suffix "SU" or "PU" after the WBA number ID, indicating a water purveyor who holds a settlement contract with either DWR or Reclamation, or has a water service contract for delivery of surface water by one or both of these two agencies. The procedure for developing urban demands for CalSim 3.0 follows the procedure used by DSIWM; urban demands within a region are the sum of public water production and self-supplied production.

Public Supplied Water Demands

Computation of public supplied water for CalSim 3.0 requires aggregating PWSS production data for the public water purveyors within each urban demand unit.[8] Water demands (assumed equal to production data) for many of the major water purveyors were subsequently updated, following the release of the 2010 UWMPs by these agencies. Table 12-5 presents urban demand units, associated water purveyors, population served, and water production data fort public supplied water demands.

Self-Supplied Water Demands

Estimates of the rural residential population were obtained by subtracting the population served by public water suppliers from the total population for the WBA. It is assumed that this rural population, located outside public water agency service areas, is self-supplied from groundwater. Self-supplied water use is estimated as the product of population and per capita water use. As part of the California Water Plan, DWR's regional offices compile information on urban water use for each county and DAU. Table 12-6 presents an example of the information available for

[7] This mapping was conducted before data from the 2010 Census were available.

[8] The PWSS database, dated April 2007, contains data through calendar year 2005. Database updates for 2006 through 2009 were obtained from DSIWM in 2011.

the water year 2005 for county-DAUs that intersect with WBA 02. Available information includes service area population, surface water and groundwater production, and water use by sector. The initial approach for developing urban demands for CalSim 3.0 was to map this information to CalSim 3.0 WBAs and demand units. This approach was later revised and simplified following the release of 2010 census data and revisions to population estimates. Typically, WBAs contain one demand unit to represent self-supplied water use throughout the WBA. Per capita water use was estimated using data supplied by DWR's Northern Regional Office. In the water year 2005, the total estimated population of the self-supplied sector in Butte, Colusa, Glenn, Plumas, Shasta, and Tehama counties was approximately 120,000. The corresponding estimated production was 59,000 acre-feet. This water use is equivalent to approximately 435 gallons per capita per day (gpcd), or 0.49 acre-feet per person per year. This water use rate is assumed to be representative of the Sacramento Valley and was used to calculate all water demands for the self-supplied sector.

Example Calculation

To illustrate the computation of self-supplied demands, consider demand unit 02_NU. The demand unit is located in the Redding basin and covers part of Shasta and Tehama counties. Intersections of WBA, county, and DAU polygons conducted in GIS show that WBA 02 overlaps portions of three county-DAUs: Shasta_137, Shasta_141, and Tehama_141. The 2010 population of WBA 02, from Table 12-4, is 71,537. Public water agencies within WBA 02 include the City of Anderson, Cottonwood WD, Rio Alto WD, Centerville CSD, Clear Creek CSD, Keswick CSA, Shasta CSD, and the western portion of the City of Redding. The service area population for these agencies is shown in Table 12-6 and totals 70,300. The self-supplied water use is calculated as 71,537 less 70,300 multiplied by the water use rate of 0.49 acre-feet per person per year. The resulting water use is approximately 600 acre-feet. Given uncertainties regarding population and water use rates, all urban demands are rounded to the nearest thousand acre-feet.

Monthly Demand Pattern

Because CalSim 3.0 is a monthly model, annual urban water demands must be disaggregated to monthly demands before inclusion in the model. For the majority of urban demand units, the monthly pattern of demands is based on historical production data for water years 2006 to 2010 (as available) from the PWSS database. Where no delivery data are available for cities and communities within a demand unit, the monthly delivery pattern is set equal to that of an adjacent demand unit. Table 12-7 presents the monthly pattern of annual urban demands used for CalSim 3.0 for each demand unit. Typically, industrial water use is aggregated with municipal water use and represented by a single demand unit. However, CalSim 3.0 includes several demand units uniquely for industrial water use. In cases where no monthly delivery data were available for these industrial demand units, monthly demands are assumed to be constant throughout the year.

Table 12-2. Population and Growth Rates by County and Detailed Analysis Unit

County	DAU	Water Budget Areas	Population Year 2000	Population Year 2010	Annual Growth Rate (%)
Butte	144	05,09,10	64,269	69,954	9%
Butte	147	10	39,790	40,333	1%
Butte	154	11,13	9,846	10,715	9%
Butte	159	12,13	18,936	21,320	13%
Butte	160	14	142	165	16%
Butte	166	09,10,11	35,051	39,629	13%
Butte	167	09	74	66	-11%
Butte	168	11,12,17N	23,273	26,127	12%
Butte	170	11,12,13,15N	12,065	11,688	-3%
Colusa	163	07N,07S,08N,08S	10,253	12,327	20%
Colusa	164	08N,08S,09	7,792	8,323	7%
Colusa	167	09	134	164	22%
El Dorado	172	26S	1,643	2,496	52%
Glenn	142	04,06,07N,08N	14,655	16,333	11%
Glenn	163	06,07N,07S,08N	10,688	10,602	-1%
Glenn	164	08N	260	242	-7%
Glenn	166	11	15	11	-27%
Glenn	167	08N,09,11	275	263	-4%
Nevada	156	14	75,493	79,477	5%
Nevada	160	14	2,147	2,644	23%
Placer	156	24	10,113	10,912	8%
Placer	161	24,26N	79,870	86,366	8%
Placer	172	23,24,26N	129,608	218,192	68%
Sacramento	172	22,23,26N,26S	634,837	712,486	12%
Sacramento	173	26N,26S,50	493,155	594,563	21%
Sacramento	186	26S,50	65,035	66,330	2%
Shasta	137	02	1,136	1,175	3%
Shasta	141	02,03	59,597	63,721	7%
Shasta	143	02,03	85,018	94,114	11%
Shasta	145	03	7,687	8,239	7%
Solano	175	25	0	2	
Solano	186	25,50	1,100	897	-18%
Solano	191	20,25,50	111,268	116,897	5%
Sutter	165	18,19	1,596	1,561	-2%
Sutter	166	11,17N,17S	3,262	3,277	0%
Sutter	168	11,16,17N	71,670	87,348	22%
Sutter	171	15S	43	25	-42%
Sutter	172	22,23,26N	2,631	2,526	-4%
Tehama	141	02	5,794	8,361	44%
Tehama	142	04,06	36,650	41,493	13%
Tehama	143	03	598	665	11%
Tehama	144	05	11,359	11,685	3%
Tehama	145	03	569	584	3%
Yolo	162	07S,20,21,50	143,232	158,830	11%
Yolo	163	07S,08S,20,21	2,631	3,073	17%
Yolo	164	08S,21	1,175	1,145	-3%
Yolo	175	20	1	19	1800%
Yolo	186	20,25,50	21,896	37,140	70%
Yolo	191	20,25,50	882	642	-27%
Yuba	156	23	1,585	1,785	13%
Yuba	160	13,14,15S,23	12,851	10,777	-16%
Yuba	171	14,15N,15S,23	45,817	59,515	30%
Total			**3,980,648**	**4,685,209**	**18%**

Source: S. Kibrya, Division of Statewide Integrated Water Management, Department of Water Resources. Personal communication, June 8, 2012.

Table 12-3. Population-Based Mapping of Demand Units to Detailed Analysis Units

WBA[1]	County-DAU Intersecting with Water Budget Areas (WBA)[1]					Corresponding Fraction of County-DAU Population Within Water Budget Area (U.S. Census 2000 data)[2]				
02	Shasta_137	Shasta_141	Tehama_141			4%	100%	95%		
03	Shasta_143	Tehama_143	Shasta_145			100%	99%	10%		
04	Tehama_142					100%				
05	Tehama_144	Butte_144				100%	9%			
06	Tehama_142	Glenn_142				0%	77%			
07N	Glenn_163	Glenn_142				85%	7%			
07S	Colusa_163	Yolo_163				40%	95%			
08N	Glenn_142	Glenn_163	Colusa_163	Glenn_164	Colusa_164	15%	15%	5%	100%	1%
08S	Colusa_163	Yolo_163	Colusa_164	Yolo_164		55%	2%	99%	8%	
09	Butte_144	Butte_166	Butte_167	Colusa_167	Glenn_167	0%	0%	100%	100%	91%
10	Butte_144	Butte_166				91%	99%			
11	Butte_166	Butte_168	Sutter_168	Butte_154	Glenn_166	1%	100%	12%	1%	100%
	Sutter_166	Glenn_167				2%	7%			
12	Butte_170	Butte_159				92%	1%			
13	Butte_154	Butte_159	Butte_170			19%	97%	7%		
14	Yuba_160	Yuba_171	Nevada_156	Nevada_160		32%	0%	1%	3%	
15N	Yuba_171	Butte_170				32%	0%			
15S	Yuba_171	Sutter_171				68%	100%			
16	Sutter_168					87%				
17N	Sutter_166	Butte_168	Sutter_168			2%	0%	0%		
17S	Sutter_166					96%				
18	Sutter_165					43%				
19	Sutter_165					57%				
20	Yolo_162	Yolo_163	Solano_191	Yolo_191		92%	2%	0%	79%	
21	Yolo_162	Yolo_163	Yolo_164			8%	2%	92%		
22	Sutter_172	Sacramento_172				22%	0%			
23	Yuba_171	Sutter_172	Placer_172	Yuba_156	Yuba_160	0%	78%	0%	2%	1%
24	Placer_161	Placer_172	Placer_156			79%	34%	0%		
25	Yolo_191	Solano_191	Solano_175	Solano_186		20%	100%	100%	1%	
26N	Placer_161	Placer_172	Sacramento_172	Sacramento_173		21%	66%	88%	0%	
26S	El Dorado_172	Sacramento_172	Sacramento_173	Sacramento_186		100%	12%	100%	3%	

Notes:

[1] Intersections that contain less than 10 persons are not included in the table.

[2] For example, 4 percent of the population of Shasta_137 is located in WBA 02.

Table 12-4. County-DAU 2010 Population Mapped to Water Budget Areas

County-DAU	Water Budget Area														Other Areas	Total
	02	03	04	05	06	07N	07S	08N	08S	09	10	11	12	13		
Butte_144	-	-	-	5,994	-	-	-	-	-	100	63,860	-	-	-	0	69,954
Butte_147	-	-	-	-	-	-	-	-	-	-	64	-	-	-	40,269	40,333
Butte_154	-	-	-	-	-	-	-	-	-	-	-	143	-	2,074	8,498	10,715
Butte_159	-	-	-	-	-	-	-	-	-	-	-	-	287	20,682	351	21,320
Butte_166	-	-	-	-	-	-	-	-	-	60	39,205	262	-	-	102	39,629
Butte_167	-	-	-	-	-	-	-	-	-	66	-	-	-	-	0	66
Butte_168	-	-	-	-	-	-	-	-	-	-	-	26,110	1	-	16	26,127
Butte_170	-	-	-	-	-	-	-	-	-	-	-	3	10,807	857	21	11,688
Colusa_163	-	-	-	-	-	10	4,919	592	6,806	-	-	-	-	-	0	12,327
Colusa_164	-	-	-	-	-	-	-	80	8,241	2	-	-	-	-	0	8,323
Colusa_167	-	-	-	-	-	-	-	-	-	164	-	-	-	-	0	164
Glenn_142	-	-	2	-	12,583	1,222	-	2,525	-	-	-	-	-	-	1	16,333
Glenn_163	-	-	-	-	7	9,012	4	1,579	-	-	-	-	-	-	0	10,602
Glenn_164	-	-	-	-	-	-	-	242	-	-	-	-	-	-	0	242
Glenn_166	-	-	-	-	-	-	-	-	-	-	-	11	-	-	0	11
Glenn_167	-	-	-	-	-	-	-	4	-	240	-	20	-	-	-1	263
Shasta_137	41	-	-	-	-	-	-	-	-	-	-	-	-	-	1,134	1,175
Shasta_141	63,527	4	-	-	-	-	-	-	-	-	-	-	-	-	190	63,721
Shasta_143	1	94,113	-	-	-	-	-	-	-	-	-	-	-	-	0	94,114
Shasta_145	-	833	-	-	-	-	-	-	-	-	-	-	-	-	7,406	8,239
Sutter_166	-	-	-	-	-	-	-	-	-	-	-	67	-	-	3,210	3,277
Sutter_168	-	-	-	-	-	-	-	-	-	-	-	10,827	-	-	76,521	87,348
Tehama_141	7,968	-	-	-	-	-	-	-	-	-	-	-	-	-	393	8,361
Tehama_142	-	-	41,366	-	22	-	-	-	-	-	-	-	-	-	105	41,493
Tehama_143	-	661	-	-	-	-	-	-	-	-	-	-	-	-	4	665
Tehama_144	-	-	-	11,685	-	-	-	-	-	-	-	-	-	-	0	11,685
Tehama_145	-	3	-	-	-	-	-	-	-	-	-	-	-	-	581	584
Yolo_162	-	-	-	-	-	-	7	-	-	-	-	-	-	-	158,823	158,830
Yolo_163	-	-	-	-	-	-	2,914	-	54	-	-	-	-	-	105	3,073
Yolo_164	-	-	-	-	-	-	-	-	91	-	-	-	-	-	1,054	1,145
Yuba_160	-	-	-	-	-	-	-	-	-	-	-	-	-	4	10,773	10,777
Total	**71,537**	**95,614**	**41,368**	**17,679**	**12,612**	**10,244**	**7,844**	**5,022**	**15,192**	**632**	**103,129**	**37,443**	**11,095**	**23,617**	**331,167**	**762,584**

Table 12-4. County-DAU 2010 Population Mapped to Water Budget Areas (contd.)

County-DAU	Water Budget Area																Other Areas	Total
	14	15N	15S	16	17N	17S	18	19	20	21	22	23	24	25	26N	26S		
Butte_160	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	164	165
Butte_168	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	26,111	26,127
Butte_170	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,667	11,688
El Dorado_172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,496	0	2,496
Nevada_156	608	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78,869	79,477
Nevada_160	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,569	2,644
Placer_156	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	10,892	10,912
Placer_161	-	-	-	-	-	-	-	-	-	-	-	-	68,348	-	18,018	-	0	86,366
Placer_172	-	-	-	-	-	-	-	-	-	-	-	479	74,395	-	143,318	-	0	218,192
Sacramento_172	-	-	-	-	-	-	-	-	-	-	890	1	-	-	627,778	83,817	0	712,486
Sacramento_173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	593,143	1,405	594,563
Solano_175	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	0	2
Solano_186	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	886	897
Solano_191	-	-	-	-	-	-	-	-	59	-	-	-	-	116,588	-	-	250	116,897
Sutter_165	-	-	-	-	-	-	673	888	-	-	-	-	-	-	-	-	0	1,561
Sutter_166	-	-	-	-	80	3,131	-	-	-	-	-	-	-	-	-	-	66	3,277
Sutter_168	-	-	-	76,398	124	-	-	-	-	-	-	-	-	-	-	-	10,826	87,348
Sutter_171	-	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25
Sutter_172	-	-	-	-	-	-	-	-	-	-	548	1,975	-	-	-	-	3	2,526
Yolo_162	-	-	-	-	-	-	-	-	146,024	12,440	-	-	-	-	-	-	366	158,830
Yolo_163	-	-	-	-	-	-	-	-	58	47	-	-	-	-	-	-	2,968	3,073
Yolo_164	-	-	-	-	-	-	-	-	-	1,054	-	-	-	-	-	-	91	1,145
Yolo_175	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	14	19
Yolo_186	-	-	-	-	-	-	-	-	8	-	-	-	-	2	-	-	37,130	37,140
Yolo_191	-	-	-	-	-	-	-	-	508	-	-	-	-	131	-	-	3	642
Yuba_156	-	-	-	-	-	-	-	-	-	-	-	27	-	-	-	-	1,758	1,785
Yuba_160	3,477	-	4	-	-	-	-	-	-	-	-	100	-	-	-	-	7,196	10,777
Yuba_171	109	18,750	40,480	-	-	-	-	-	-	-	-	176	-	-	-	-	0	59,515
Total	**4,270**	**18,771**	**40,509**	**76,398**	**220**	**3,131**	**673**	**888**	**146,662**	**13,541**	**1,438**	**2,758**	**142,763**	**116,734**	**789,129**	**679,456**	**193,234**	**2,230575**

Key:
DAU = Detailed Analysis Unit

Table 12-5. Public and Self-Supplied Water Use by Urban Demand Unit

Demand Unit	Water Purveyor Retail (Wholesale)	Public Supplied		Self-Supplied		Total	
		Population	Production (TAF)	Population	Production (TAF)	Population	Production[5] (TAF)
02_NU	City of Anderson, Cottonwood WD, Rio Alto WD, self-supplied	17,100	4.8	1,200	0.6	18,300	5
02_PU	Centerville CSD, Clear Creek CSD, Keswick CSA2, Shasta CSD	16,600	10.0			16,600	10
02_SU	City of Redding (part)	36,600	11.0			36,600	11
03_NU	Self-supplied			10,700	5.2	10,700	5
03_PU1	Jones Valley CSA, City of Shasta Lake, Mountain Gate CSD	13,500	4.4			13,500	4
03_PU2	Bella Vista WD	16,500	13.6			16,500	14
03_PU3	City of Redding (part)	18,300	5.5			18,300	5
03_SU	City of Redding (part)	36,600	11.0			36,600	11
04_NU1	City of Red Bluff	15,400	4.9			15,400	5
04_NU2	City of Corning, Gerber-Las Flores CSD, self-supplied	8,400	2.8	17,500	8.6	25,900	11
05_NU	City of Red Bluff, Los Molinos CSD, self-supplied	1,400	0.6	16,300	8.0	17,700	9
06_NU	City of Orland, Self-supplied	7,500	2.4	5,100	2.5	12,600	5
07N_NU	Cal-Water SC – Willows, self-supplied	7,200	1.8	3,100	1.5	10,200	3
07S_NU	Arbuckle PUD, Cacheville CSD, self-supplied	2,400	1.0	5,400	2.7	7,800	4
08N_NU	Cal-Water SC – Hamilton, self-supplied	0	0.5	5,000	2.5	5,000	3
08S_NU	City of Colusa, City of Williams, self-supplied	10,800	2.5	4,400	2.2	15,200	5
09_NU	Self-supplied			600	0.3	600	0
10_NU1	Cal-Water SC – Chico	100,300	28.9			100,300	29
10_NU2	Durham ID, Self-supplied	1,400	1.9	1,400	0.7	2,800	3
11_NU1	Thermalito ID – Oroville	9,700	2.5			9,700	3
11_NU2	City of Biggs, City of Gridley, Live Oak WD, self-supplied	16,800	3.5	11,000	5.4	27,800	9
12_NU1	Cal-Water SC – Oroville	9,500	3.3			9,500	3
12_NU2	Self-supplied			1,600	0.8	1,600	1
13_NU1	South Feather Water and Power Agency – Oroville	15,300	5.6			15,300	6
13_NU2	South Feather Water and Power Agency, self-supplied	0	0.0	8,300	4.1	8,300	4
14_NU	Self-supplied			4,300	2.1	4,300	2
15N_NU	Cal-Water SC – Marysville, self-supplied	12,700	2.9	6,000	3.0	18,800	6
15S_NU	Olivehurst PUD, City of Wheatland, Linda County WD, self-supplied	30,000	8.0	10,600	5.2	40,500	13
16_NU	Self-supplied			21,100	10.3	21,100	10
16_PU	City of Yuba City	55,300	15.8			55,300	16
17N_NU	Self-supplied			200	0.1	200	0
17S_NU	Sutter CSD, self-supplied			0	0.0	3,900	1
18_NU	Self-supplied			700	0.3	700	0
19_NU	Self-supplied			900	0.4	900	0
20_NU1	City of Davis, University of California at Davis, City of Woodland	165,300	31.0	0	0.0	165,300	31

Table 12-5. Public and Self-Supplied Water Use by Urban Demand Unit (contd.)

Demand Unit	Water Purveyor Retail (Wholesale)	Public Supplied		Self-Supplied		Total	
		Population	Production (TAF)	Population	Production (TAF)	Population	Production[5] (TAF)
20_NU2	City of Winters, Esparto CSD, Madison CSD, self-supplied	10,700	3.2	0	0.0	10,700	3
21_NU	Knights Landing Community Service District, self-supplied	1,500	0.3	0	0.0	1,500	0
21_PU	City of West Sacramento	46,500	14.6			46,500	15
22_NU	Sacramento International Airport, SCWA Zone 50, self-supplied	0	1.7	1,400	0.7	1,400	2
23_NU	Self-supplied	0	0.0	2,800	1.4	2,800	1
24_NU1	Placer County WA – Upper Zone 1	26,300	7.5			26,300	8
24_NU2	Placer County WA – Lower Zone 1	109,200	41.1			109,200	41
24_NU3	Nevada ID – North Auburn	6,400	2.1			6,400	2
24_NU4	Self-supplied	0	0.0	900	0.4	900	0
25_NU	City of Rio Vista, Cal-Water SC – Dixon, self-supplied	16,800	4.7	2,700	1.3	19,400	6
25_PU	City of Vacaville	97,300	18.5			97,300	18
26N_NU1	Sacramento Suburban WD – NSA, Cal-Am WC – Antelope, Lincoln Oaks, Rio Linda Elverta CWD	296,600	37.5			296,600	37
26N_NU2	Carmichael WD	43,000	11.4			43,000	11
26N_NU3	City of Sacramento (north)	163,300	44.2			163,300	44
26N_NU4	Sacramento Suburban WD – SSA	168,000	20.0			168,000	20
26N_NU5	Golden State WC – Arden, Del Paso Manor WD, SCWA Zone 41 – Arden Park Vista, Cal-Am WC – Arden	24,100	9.4			24,100	9
26N_PU1	City of Roseville	124,000	32.6			124,000	33
26N_PU2	San Juan WD	31,000	13.5			31,000	13
26N_PU3	Orange Vale WC, Citrus Heights WD, Fair Oaks WD, City of Folsom	125,800	38.4			125,800	38
26S_NU1	City of Sacramento (south)	303,200	82.1			303,200	82
26S_NU2	Cal-Am WC – Parkway, Suburban, Rosemont	107,700	23.2			107,700	23
26S_NU3	Florin County WD, Fruitridge Vista WC, Tokay Park WC (Zone 41)	26,200	7.2			26,200	7
26S_NU4	Aerojet	N/A	2.7			N/A	3
26S_PU1	City of Folsom, Folsom State Prison	64,400	25.1			64,400	25
26S_PU2	Golden State WC – Cordova	47,800	18.4			47,800	18
26S_PU3	California Parks and Recreation	N/A	1.0			N/A	1
26S_PU4	SCWA Zone 41 – SSA (Zone 40)	67,200	12.1			67,200	12
26S_PU5	Elk Grove WD (SCWA)	39,700	9.1			39,700	9
26S_PU6	SCWA Zone 41 – CSA, SCWA Zone 41 – NSA, Cal-Am WC – Sunrise/Security Park	80,900	21.0			80,900	21

Table 12-5. Public and Self-Supplied Water Use by Urban Demand Unit (contd.)

Demand Unit	Water Purveyor Retail (Wholesale)	Public Supplied		Self-Supplied		Total	
		Population	Production (TAF)	Population	Production (TAF)	Population	Production[5] (TAF)
AMCYN	City of American Canyon	19,500	3.7			19,500	4
ANTOC	City of Antioch	102,300	19.3			102,300	19
BNCIA	City of Benicia	28,000	10.5			28,000	10
CCWD	Contra Costa WD	193,000	346.4			193,000	346
CLLPT	19 M&I water purveyors	No data	10.6			No data	11
CSPSO	California State Prison – Solano	10,000	1.0			10,000	1
ELDID	El Dorado Hills ID	112,000	11.8			112,000	12
FRFLD	City of Fairfield	102,100	22.2			102,100	22
NAPA	City of Napa, St Helena, Calistoga	86,700	15.1			86,700	15
PCWA3	Placer County WA – Zone 3	3,600	0.8			3,600	1
SUISN	City of Suisun	29,600	4.5			29,600	5
TVAFB	Travis Air Force Base	20,000	3.4			20,000	3
VLLJO	City of Vallejo	118,300	19.2			118,300	19

Notes:

[1] The City of Redding is served by six large pressure zones. The part of the city located on the right bank of the Sacramento River (demand unit 02_SU) is served by the Foothill, Hill 900, and Cascade zones (and the much smaller Mary Lake Zone). The part of the city located on the left bank (demand units 03_PU3 and 03_SU) is served by the Buckeye, Hilltop and Enterprise zones (and the much smaller Summit City Zone). The Buckeye Zone (demand unit 02_PU) is dependent on surface water deliveries from the Buckeye Water Treatment Plant. This plant can also deliver water to part of the Hilltop Zone (which for modeling purposes is combined with the Enterprise Zone). Only the Enterprise Zone (demand unit 03_SU) and Cascade Zone have access to groundwater (Redding, 2011). Total demand for the City of Redding was disaggregated between demand units 02_PU, 02_SU, and 03_PU3 based on pressure zones and the population served. The population was estimated by overlaying the pressures zones onto a GIS layer of Census 2000 population data. Water demands were subsequently disaggregated as follows: 02_SU - 40 percent; 03_PU3 - 20 percent; 03_SU - 40 percent. The ability of the Hilltop Zone to receive water from both the Buckeye and Foothill water treatment plants is not represented in CalSim 3.0.

[2] For modeling purposes, the City of Red Bluff is assumed to be located entirely in WBA 04.

[3] Production data for demand units external to the WBA domain does not include groundwater or surface water sources from outside the Sacramento and San Joaquin hydrologic regions. These WBAs are identified using a 4- or 5-letter acronym.

[4] Population estimates have been rounded to nearest 100 persons.

[5] Urban demands for CalSim 3.0 are rounded to nearest thousand acre-feet.

Key:

Cal-Am WC = California American Water Company
Cal-Water SC = California Water Service Company
CSA = Central Service Area
CSD = Community Service District
CWD = Community Water District
ID = Irrigation District
NSA = North Service Area
PUD = Public Utility District
SCWA = Sacramento County Water Agency
SMUD = Sacramento Municipal Utility District
SSA = South Service Area
TAF = thousand acre-feet
WA = Water Agency
WC = Water Company
WD = Water District

Table 12-6. Public Water Supply Statistics Water Use Data for Water Budget Area 02

County-DAU	2005 Public Supply (TAF)						Self-Supplied (TAF)		
Shasta_137	**-**	**-**	**-**	**-**	**-**	**-**	**Rural**	**Industrial**	**Golf Course**
Population							1162		
Groundwater Production									
Surface Water Production									
Single-Family Residential Use							189		
Multi-Family Residential Use									
Commercial Use							29		
Industrial Use							4		
Landscape Use									
Energy Production									
Urban Per-Capita Water Use							0		
Indoor Per-Capita Water Use Estimate							0		
Single-Family Residential Use – Interior							62		
Multi-Family Residential Use – Interior									
Shasta_141	**Anderson**	**Centerville**	**Cottonwood**	**Clear Lake CSD**	**Redding**	**Shasta CSD**	**Rural**	**Industrial**	**Golf Course**
Population	10,441	3,256	3,255	13,832	29,128	2,827	1,600		
Groundwater Production	2,412	0	937	0	2,795	0	305	17,372	58
Surface Water Production	0	1,618	0	6,307	6,714	748	0	0	92
Single Family Residential Use	1,692	1,594	798	6,307	5,932	748	260	0	0
Multi-Family Residential Use	234	0	0	0	802	0	0	0	0
Commercial Use	400	4	123	0	2,287	0	40	0	0
Industrial Use	12	7	16	0	56	0	5	17,372	0
Landscape Use	74	12	0	0	431	0	0	0	150
Energy Production	0	0	0	0	0	0	0	0	0
Urban Per-Capita Water Use	0	0	0	0	0	0	0		
Indoor Per-Capita Water Use Estimate	0	0	0	0	0	0	0		
Single-Family Residential Use – Interior	765	540	301	853	2,287	292	86		
Multi-Family Residential Use – Interior	167	0	0	0	577	0	0		

Table 12-6. Public Water Supply Statistics Water Use Data for Water Budget Area 02 (contd.)

County-DAU	2005 Public Supply (TAF)						Self-Supplied (TAF)		
Tehama_141	**Rio Alto WD**	**-**	**-**	**-**	**-**	**-**	**Rural**	**Industrial**	**Golf Course**
Population	3,050						3638		
Groundwater Production	581						693	0	0
Surface Water Production	0						0	660	0
Single-Family Residential Use	495						590	0	0
Multi-Family Residential Use	0						0	0	0
Commercial Use	76						91	0	0
Industrial Use	10						12	0	0
Landscape Use	0						0	660	0
Energy Production	0						0	0	0
Urban Per-Capita Water Use	0						0		
Indoor Per-Capita Water Use Estimate	0						0		
Single-Family Residential Use – Interior	163						195		
Multi-Family Residential Use – Interior	0						0		

Source: Todd Hillaire, DWR Northern Regional Office, Personal communication.

Key:
CSD = Community Service District
DAU = Detailed Analysis Units
TAF = thousand acre-feet
WD = Water District

Table 12-7. Monthly Demand Pattern by Demand Unit

Demand Unit	Water Purveyor Retail (Wholesale)	Monthly Delivery Pattern (%)											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
02_NU	City of Anderson, Cottonwood WD, Rio Alto WD, self-supplied	8.4%	4.8%	4.2%	4.2%	3.8%	4.5%	6.2%	9.2%	12.7%	15.0%	14.7%	12.1%
02_PU	Centerville CSD, Clear Creek CSD, Keswick CSA, Shasta CSD	8.8%	4.8%	3.6%	3.0%	2.7%	3.5%	5.0%	8.3%	12.4%	17.0%	16.9%	13.9%
02_SU	City of Redding (part)	8.8%	5.1%	4.4%	4.2%	3.8%	4.9%	6.2%	9.2%	12.2%	15.0%	14.4%	11.9%
03_NU	Self-supplied	8.4%	5.0%	4.4%	4.5%	4.0%	4.7%	6.4%	9.0%	12.5%	14.9%	14.3%	12.0%
03_PU1	Jones Valley CSA, City of Shasta Lake, Mountain Gate CSD	8.8%	5.6%	5.4%	4.7%	4.4%	5.1%	6.4%	8.3%	11.3%	14.1%	14.3%	11.8%
03_PU2	Bella Vista WD	7.6%	4.5%	3.5%	2.5%	2.5%	2.9%	5.1%	9.5%	15.0%	18.1%	16.0%	12.7%
03_PU3	City of Redding (part)	8.8%	5.1%	4.4%	4.2%	3.8%	4.9%	6.2%	9.2%	12.2%	15.0%	14.4%	11.9%
03_SU	City of Redding (part)	8.8%	5.1%	4.4%	4.2%	3.8%	4.9%	6.2%	9.2%	12.2%	15.0%	14.4%	11.9%
04_NU1	City of Red Bluff	9.3%	5.6%	4.6%	4.7%	4.4%	5.1%	6.2%	9.0%	11.6%	13.9%	14.4%	11.3%
04_NU2	City of Corning, Gerber-Las Flores CSD, self-supplied	9.4%	6.8%	5.7%	5.5%	5.1%	6.0%	6.8%	8.6%	10.3%	12.6%	12.3%	11.0%
05_NU	City of Red Bluff, Los Molinos CSD, self-supplied	7.9%	4.7%	3.9%	4.2%	3.5%	4.4%	5.8%	9.6%	13.6%	16.0%	15.2%	11.3%
06_NU	City of Orland, Self-supplied	8.0%	5.6%	4.2%	4.8%	4.9%	5.4%	6.6%	9.5%	11.3%	13.9%	14.1%	11.6%
07N_NU	California Water Service Company – Willows, self-supplied	8.3%	5.5%	4.7%	4.7%	4.2%	5.4%	7.2%	9.8%	12.3%	14.0%	13.1%	10.8%
07S_NU	Arbuckle PUD, Cacheville CSD, self-supplied	9.2%	5.7%	3.9%	3.7%	3.5%	4.5%	6.5%	10.3%	13.1%	14.5%	13.7%	11.2%
08N_NU	California Water Service Company – Hamilton, self-supplied	7.9%	4.7%	4.2%	4.6%	4.2%	5.4%	6.7%	9.9%	13.0%	14.7%	13.8%	11.0%
08S_NU	City of Colusa, City of Williams, self-supplied	9.2%	5.7%	4.8%	4.4%	4.2%	5.2%	6.8%	9.5%	11.9%	13.5%	13.5%	11.1%
09_NU	Self-supplied	10.1%	6.5%	5.7%	4.4%	4.1%	5.4%	7.0%	9.3%	11.2%	12.6%	12.8%	10.8%
10_NU1	California Water Service Company – Chico	8.7%	5.4%	4.5%	4.2%	4.0%	5.3%	6.9%	9.7%	11.9%	14.2%	13.8%	11.5%
10_NU2	Durham ID, Self-supplied	8.2%	8.7%	6.8%	4.1%	2.9%	5.0%	5.3%	10.0%	10.1%	14.3%	10.6%	13.9%
11_NU1	Thermalito ID – Oroville	8.9%	5.2%	4.6%	4.0%	3.6%	4.1%	5.7%	8.8%	12.6%	15.7%	14.8%	12.0%
11_NU2	City of Biggs, City of Gridley, Live Oak WD, self-supplied	8.1%	5.4%	4.7%	4.5%	4.1%	5.3%	6.8%	9.9%	12.3%	14.4%	13.5%	11.0%
12_NU1	California Water Service Company – Oroville	9.1%	6.0%	4.7%	4.6%	4.0%	5.0%	5.6%	7.8%	10.2%	13.2%	15.9%	14.0%
12_NU2	Self-supplied	8.5%	4.7%	4.2%	4.1%	3.8%	4.8%	6.3%	9.7%	13.2%	15.0%	14.1%	11.6%
13_NU1	South Feather Water and Power Agency – Oroville	8.6%	5.0%	4.5%	4.4%	3.9%	4.9%	6.2%	9.4%	12.2%	14.9%	14.1%	11.8%
13_NU2	South Feather Water and Power Agency, self-supplied	8.6%	5.0%	4.5%	4.4%	3.9%	4.9%	6.2%	9.4%	12.2%	14.9%	14.1%	11.8%
14_NU	Self-supplied	8.6%	5.0%	4.5%	4.4%	3.9%	4.9%	6.2%	9.4%	12.2%	14.9%	14.1%	11.8%
15N_NU	California Water Service Company – Marysville, self-supplied	8.3%	5.8%	5.3%	5.3%	4.8%	5.8%	6.7%	9.0%	11.9%	13.2%	13.2%	10.7%

Table 12-7. Monthly Demand Pattern by Demand Unit (contd.)

Demand Unit	Water Purveyor Retail (Wholesale)	Monthly Delivery Pattern (%)											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
15S_NU	Olivehurst PUD, City of Wheatland, Linda CWD, self-supplied	8.2%	5.2%	4.8%	4.4%	4.0%	5.1%	5.8%	8.9%	12.1%	15.0%	14.6%	12.0%
16_NU	Self-supplied	8.5%	4.7%	4.2%	4.1%	3.8%	4.8%	6.3%	9.7%	13.2%	15.0%	14.1%	11.6%
16_PU	City of Yuba City	8.5%	5.7%	5.0%	4.9%	4.5%	5.9%	7.1%	9.5%	11.7%	13.2%	12.8%	11.0%
17N_NU	Self-supplied	8.5%	4.7%	4.2%	4.1%	3.8%	4.8%	6.3%	9.7%	13.2%	15.0%	14.1%	11.6%
17S_NU	Sutter CSD, self-supplied	7.1%	4.6%	3.8%	3.9%	3.4%	5.1%	7.3%	11.0%	13.1%	15.1%	14.3%	11.2%
18_NU	Self-supplied	8.5%	4.7%	4.2%	4.1%	3.8%	4.8%	6.3%	9.7%	13.2%	15.0%	14.1%	11.6%
19_NU	Self-supplied	8.5%	4.7%	4.2%	4.1%	3.8%	4.8%	6.3%	9.7%	13.2%	15.0%	14.1%	11.6%
20_NU1	Cities of Davis and Woodland, University of California at Davis	9.1%	6.1%	5.0%	4.8%	4.4%	6.0%	7.2%	9.7%	11.6%	12.8%	12.5%	10.8%
20_NU2	City of Winters, Esparto CSD, Madison CSD, self-supplied	8.8%	4.9%	4.0%	4.7%	3.6%	4.9%	7.5%	7.8%	14.5%	16.2%	13.1%	9.9%
21_NU	Knights Landing Community Service District, self-supplied	7.6%	4.4%	3.6%	2.9%	2.5%	4.1%	7.5%	8.3%	14.9%	16.9%	15.5%	11.9%
21_PU	City of West Sacramento	8.3%	5.5%	4.8%	4.6%	4.2%	5.4%	6.9%	9.7%	12.0%	13.9%	13.4%	11.2%
22_NU	Sacramento Int. Airport, SCWA Zone 50, self-supplied	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%
23_NU	Self-supplied	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%
24_NU1	Placer County WA – Upper Zone 1	8.9%	5.2%	4.3%	4.0%	4.0%	4.7%	6.2%	8.8%	11.6%	14.6%	14.7%	12.9%
24_NU2	Placer County WA – Lower Zone 1	9.1%	5.4%	4.5%	4.5%	3.9%	4.6%	6.2%	9.3%	11.9%	14.7%	14.0%	12.0%
24_NU3	Nevada ID – North Auburn	9.6%	5.7%	4.6%	4.1%	4.2%	4.8%	6.1%	9.0%	11.7%	14.5%	13.6%	12.1%
24_NU4	Self-supplied	9.6%	5.7%	4.6%	4.1%	4.2%	4.8%	6.1%	9.0%	11.7%	14.5%	13.6%	12.1%
25_NU	City of Rio Vista, Cal-Water SC – Dixon, self-supplied	8.9%	5.2%	4.4%	4.5%	3.9%	5.7%	7.3%	9.7%	12.2%	13.9%	13.1%	11.4%
25_PU	City of Vacaville	9.0%	5.9%	5.0%	4.7%	4.2%	5.5%	7.1%	9.7%	11.5%	13.2%	13.0%	11.3%

Table 12-7. Monthly Demand Pattern by Demand Unit (contd.)

Demand Unit	Water Purveyor Retail (Wholesale)	Monthly Delivery Pattern (%)											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
26N_NU1	Sacramento Suburban WD – NSA, Cal-Am WC – Antelope, Lincoln Oaks, Rio Linda Elverta CWD	8.7%	5.7%	4.7%	4.5%	4.1%	5.8%	6.2%	9.2%	11.8%	14.0%	13.8%	11.6%
26N_NU2	Carmichael WD	8.9%	5.3%	4.1%	3.8%	3.6%	4.8%	6.3%	9.4%	12.8%	14.5%	14.2%	12.3%
26N_NU3	City of Sacramento (north)	14.1%	9.6%	8.6%	4.4%	4.0%	4.5%	4.7%	7.8%	10.3%	11.7%	10.8%	9.4%
26N_NU4	Sacramento Suburban WD – SSA	9.3%	5.6%	4.7%	4.7%	3.8%	4.6%	6.5%	9.0%	11.5%	14.3%	14.1%	11.8%
26N_NU5	Golden State WC – Arden, Del Paso Manor WD, SCWA Zone 41 – Arden Park Vista, Cal-Am WC – Arden	8.6%	6.4%	4.7%	4.4%	4.5%	5.6%	7.2%	9.0%	12.2%	12.8%	12.9%	11.8%
26N_PU1	City of Roseville	9.0%	5.2%	4.0%	3.8%	3.6%	5.1%	6.5%	9.6%	11.9%	13.9%	13.4%	13.9%
26N_PU2	San Juan WD	8.8%	4.7%	3.8%	3.6%	3.2%	4.4%	6.4%	9.6%	13.1%	15.4%	14.9%	12.2%
26N_PU3	Orange Vale WC, Citrus Heights WD, Fair Oaks WD, City of Folsom	8.0%	4.8%	3.8%	3.9%	3.4%	4.5%	7.0%	9.6%	12.7%	15.1%	14.6%	12.5%
26N_PU3	Orange Vale WC, Citrus Heights WD, Fair Oaks WD, City of Folsom	8.0%	4.8%	3.8%	3.9%	3.4%	4.5%	7.0%	9.6%	12.7%	15.1%	14.6%	12.5%
26S_NU1	City of Sacramento (south)	10.6%	7.1%	6.4%	4.9%	4.5%	5.1%	5.3%	8.8%	11.6%	13.1%	12.1%	10.5%
26S_NU2	Cal-Am WC – Parkway, Suburban, Rosemont	9.1%	6.3%	5.8%	5.1%	4.7%	5.6%	6.9%	9.0%	11.2%	12.8%	12.5%	11.0%
26S_NU3	Florin County WD, Fruitridge Vista WC, Tokay Park WC (Zone 41)	9.1%	5.4%	5.7%	5.1%	5.4%	6.0%	8.4%	9.0%	11.0%	14.2%	11.2%	9.6%
26S_NU4	Aerojet	7.0%	9.6%	6.8%	8.8%	12.1%	9.8%	7.0%	7.4%	6.0%	7.0%	10.8%	7.6%
26S_PU1	City of Folsom, Folsom State Prison	7.3%	5.3%	3.7%	5.4%	4.8%	6.3%	7.5%	9.8%	11.4%	13.9%	13.0%	11.7%
26S_PU2	Golden State WC – Cordova	8.7%	5.8%	4.7%	4.8%	4.3%	5.4%	6.9%	9.2%	11.5%	13.7%	13.4%	11.6%
26S_PU3	California Parks and Recreation	7.4%	7.0%	5.6%	5.6%	5.6%	7.0%	8.0%	9.0%	10.3%	12.3%	11.6%	10.6%
26S_PU4	SCWA Zone 41 – SSA (Zone 40)	8.8%	5.1%	4.2%	4.3%	4.5%	5.3%	7.6%	10.0%	12.8%	13.7%	13.3%	10.4%
26S_PU5	Elk Grove WD (SCWA)	9.2%	5.5%	4.6%	4.3%	3.8%	5.1%	7.0%	9.5%	11.9%	14.1%	13.4%	11.5%
26S_PU6	SCWA Zone 41 – CSA, SCWA Zone 41 – NSA, Cal-Am WC – Sunrise/Security Park	8.8%	5.2%	4.4%	4.3%	4.4%	5.3%	7.6%	9.9%	12.6%	13.6%	13.2%	10.8%

Table 12-7. Monthly Demand Pattern by Demand Unit (contd.)

Demand Unit	Water Purveyor Retail (Wholesale)	Monthly Delivery Pattern (%)											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
AMCYN	City of American Canyon	8.8%	6.4%	5.7%	5.2%	4.9%	6.2%	7.4%	9.0%	11.4%	12.0%	12.4%	10.6%
ANTOC	City of Antioch	9.2%	6.2%	5.2%	4.8%	4.5%	5.8%	7.2%	9.7%	11.3%	12.7%	12.4%	11.0%
BNCIA	City of Benicia	9.1%	6.5%	5.5%	5.2%	5.0%	6.1%	7.5%	9.6%	11.0%	12.0%	11.8%	10.7%
CCWD	Contra Costa WD	6.8%	4.8%	4.0%	4.9%	4.3%	5.7%	7.0%	10.5%	12.5%	14.3%	13.7%	11.6%
CLLPT	19 M&I water purveyors	8.7%	7.2%	6.9%	6.8%	5.9%	6.3%	6.5%	8.0%	9.6%	11.9%	11.9%	10.3%
CSPSO	California State Prison – Solano	7.6%	7.6%	7.4%	8.6%	8.2%	8.5%	8.2%	8.8%	8.6%	9.0%	9.1%	8.5%
ELDID	El Dorado Hills ID	9.2%	4.9%	3.9%	3.6%	3.1%	4.1%	5.2%	7.9%	12.4%	16.4%	16.2%	12.9%
FRFLD	City of Fairfield	9.4%	6.3%	5.5%	5.2%	4.7%	5.9%	7.1%	9.4%	10.9%	12.3%	12.2%	11.1%
NAPA	City of Napa, St Helena, Calistoga	9.2%	5.8%	5.0%	5.0%	4.4%	5.8%	7.2%	9.6%	11.5%	12.8%	12.5%	11.2%
PCWA3	Placer County WA – Zone 3	8.1%	5.9%	5.9%	6.1%	5.3%	5.9%	6.3%	8.6%	10.9%	13.2%	13.1%	10.6%
SUISN	City of Suisun	8.6%	6.1%	5.5%	5.4%	5.1%	6.1%	7.4%	9.5%	11.1%	12.3%	12.2%	10.9%
TVAFB	Travis Air Force Base	8.6%	6.1%	5.5%	5.4%	5.1%	6.1%	7.4%	9.5%	11.1%	12.3%	12.2%	10.9%
VLLJO	City of Vallejo	8.7%	6.8%	6.1%	6.2%	5.6%	6.6%	7.6%	9.3%	10.5%	11.5%	11.2%	9.9%

Notes:

[1] Monthly pattern for 03_NU based on City of Anderson monthly production data.

[2] Monthly pattern for 09_NU based on City of Williams monthly production data.

[3] Monthly patterns for 12_NU2, 16_NU, 17N_NU, 18_NU, and 19_NU based on City of Biggs monthly production data.

[4] Monthly pattern for 13_NU2 based on South Feather Water and Power Agency monthly production data.

[5] Monthly pattern for 14_NU2 based on City of Marysville monthly production data.

[6] Monthly pattern for 23_NU based on City of Davis monthly production data.

[7] Monthly pattern for 24_NU4 based on North Auburn monthly production data.

Key:
Cal-Am WC = California American Water Company
Cal-Water SC = California Water Service Company
CSA = Central Service Area
CSD = Community Service District
CWD = Community Water District
ID = Irrigation District
MUD = Municipal Utility District
NSA = North Service Area
PUD = Public Utility District
SCWA = Sacramento County Water Agency
SMUD = Sacramento Municipal Utility District
SSA = South Service Area
WA = Water Agency
WC = Water Company
WD = Water District

Surface Water Diversions

Urban demand units that divert surface water to meet M&I demands are described briefly in Chapter 3 (Demand Units). Table 12-8 lists these demand units and summarizes information relating to the point of diversion and water treatment facilities. Average annual diversions presented in the table are based on water years 2006 through 2010 or shorter period where data are incomplete. Data sources include the PWSS database and 2010 UWMPs.

Groundwater Pumping

The majority of urban demand units represented in CalSim 3.0 depend on a single source of water, either surface water or groundwater. However, 29 demand units conjunctively use surface water and groundwater depending on hydrologic conditions, system capacities, water rights, and water contracts. For these 29 demand units, a minimum volume of groundwater pumping is specified as a fraction of urban demand. Once this level of groundwater pumping is met, CalSim 3.0 diverts surface water, as physically available, to meet demand up to any restrictions imposed by water rights, contracts, and agreements. Finally, any unmet demand is met by additional groundwater pumping. Currently, no system capacity restrictions (e.g., water treatment capacities) are represented in the model. Table 12-9 lists urban demand units that have access to both surface water and groundwater and presents the assumed level of minimum groundwater pumping. This level of groundwater pumping is a surrogate for capacity, operational constraints, or other factors, which are not directly represented in CalSim 3.0.

Table 12-8. Surface Water Diversions for Municipal and Industrial Water Supply

Demand Unit[1]	Water Treatment Facility			Point of Diversion		Average Annual Diversion (TAF/year)
	Facility	CalSim 3.0 Node	Operator	Stream/Canal	CalSim 3.0 Node	
02_PU	Centerville WTP	WTPCSD	Centerville CSD	Whiskeytown Reservoir	WKYTN	2[2]
			Clear Creek CSD			7[2]
	Keswick WTP	None	Keswick CSA	Spring Creek Conduit	WKYTN	<1[3]
	Shasta WTP	None	Shasta CSD	Spring Creek Conduit	WKYTN	1[4]
02_SU	Foothill WTP	WTPFTH	City of Redding	Sacramento River	SAC296	15[5]
03_SU						
03_PU1	Jones Valley WTP	WTPJMS	Jones Valley CSA	Lake Shasta	SHSTA	2[6]
	Mountain Gate WTP		Mountain Gate CSD			1[7]
	Fisherman Point WTP		Shasta Lake CSD			3[8]
03_PU2	Bella Vista WTP	WTPBLV	Bella Vista WD	Sacramento River	SAC294	15[9]
03_PU3	Buckeye WTP	WTPBUK	City of Redding	Spring Creek Conduit	WKYTN	3[5]
11_NU1	Thermalito WTP	None	Thermalito ID	Power Canal	THRMF	2[10]
12_NU1	Cal Water Filtration Plant	None	Cal-Water SC - Oroville	Miocene Canal	MIO023	3[11]
				Power Canal	THRMF	1[11]
13_NU1	Miners Ranch WTP	WTPMNR	South Feather Water & Power Agency	Miners Ranch Canal/Reservoir	MNRRH	6[12]
13_NU2	Palermo Canal	None	South Feather Water & Power Agency	Oroville Dam	OROVL	5[13]
	Bangor WTP	None	South Feather Water & Power Agency	Miners Ranch Canal/Reservoir	MNRRH	7[14]
15N_NU	Raw water	None	City of Marysville	Yuba River	YUB003	2[15]
16_PU	Yuba City WTP	WTPCYC	City of Yuba City	Feather River	FTR031	15[16]
20_NU1	Davis-Woodland WTP(planned facility)	WTPDWP	Woodland-Davis Clean Water Agency	Sacramento River	SAC074	0[17]
21_PU	Bryte Bend WTP	WTPBTB	City of West Sacramento	Sacramento River	SAC065	15[18]
24_NU1	Auburn WTP	WTPAUB	Placer County WA (upper Zone 1)	Lower Boardman Canal	LBC038	7[19]
	Bowman WTP	WTPBWM	Placer County WA (upper Zone 1)	Bear River Canal	BEC022	
	Christian Valley WTP		Christian Valley Park CSD	Lower Boardman Canal		1[20]
24_NU2	Foothill WTP	WTPFSS	Placer County WA (lower Zone 1)	South Canal	STH004	31[21]
	Sunset WTP					
	Ophir WTP (planned facility)	WTPOPH			STH001	0[22]
24_NU3	North Auburn WTP	None	Nevada ID	Wise Canal	WSE004	2[23]
25_PU	Vacaville WTP	WTPDEF	City of Vacaville	Putah South Canal	PSC017	13[24]
	North Bay Regional WTP	WTPNBR	City of Fairfield	North Bay Aqueduct	NBA011	
26N_PU1	Barton Road WTP	WTPRSV	City of Roseville	Lake Folsom	FOLSM	33[25]
26N_PU2	Sydney Petersen WTP	WTPSJP	San Juan WD	Lake Folsom	FOLSM	14[26]
26N_PU3						35[27]
26N_NU1						13[28]

Table 12-8. Surface Water Diversions for Municipal and Industrial Water Supply (contd.)

Demand Unit[1]	Water Treatment Facility			Point of Diversion		Average Annual Diversion (TAF/year)
	Facility	CalSim 3.0 Node	Operator	Stream/Canal	CalSim 3.0 Node	
26N_NU1	Fairbairn WTP	WTPFBN	City of Sacramento	American River	AMR007	55[29]
26N_NU3						
26N_NU4						
26S_NU1						
26S_NU2						
26N_NU2	Bajamot WTP	WTPBJM	Carmichael WD	American River	AMR017	9[30]
26S_PU1	Folsom WTP	WTPFOL	City of Folsom	Lake Folsom (City intake)	FOLSM	23[31]
	Folsom Prison WTP		Folsom Prison			2[32]
26S_NU4	Raw water	N/A	Aerojet	Lake Folsom (City intake)	FOLSM	3[33]
26S_PU2	Coloma WTP	WTPCOL	Golden State WC ─ Cordoba	Folsom South Canal	FSC003	8[34]
	Pyrites WTP					
26S_PU3	Raw water	N/A	California Parks and Recreation	Lake Folsom	FOLSM	2[35]
26N_NU3	Sacramento River WTP	WTPSAC	City of Sacramento	Sacramento River	SAC062	63[36]
26S_NU1						
26S_PU4						
26S_PU1	Vineyard WTP	WTPVNY	Sacramento County WA	Sacramento River	SAC050	0[37]
26S_PU4						
26S_PU5						
26S_PU6						

Table 12-8. Surface Water Diversions for Municipal and Industrial Water Supply (contd.)

Demand Unit[1]	Water Treatment Facility			Point of Diversion		Average Annual Diversion (TAF/year)
	Facility	CalSim 3.0 Node	Operator	Stream/Canal	CalSim 3.0 Node	
AMCYN	American Canyon WTP	WTPAMC	City of American Canyon	North Bay Aqueduct	NBA027	4[39]
ANTOC	Antioch WTP	None	City of Antioch	San Joaquin River	SJR006	6[40]
				Contra Costa Canal	CCC007	13[40]
BNCIA	Benicia WTP	WTPBNC	City of Benicia	Putah South Canal	PSC033	2[42]
				North Bay Aqueduct	NBA021	9[41]
CCWD	Ralph Bollman, Randall-Bold WTPs	None	Contra Costa WD, Diablo WD	Rock Slough	RSC004	117[43]
				Old River	OMR021	
				Victoria Canal	VCT002	0[44]
CLLPT	Various	None	19 water purveyors	Clear Lake	CLRLK	11[45]
CSPSO	State Prison WTP	None	California State Prison – Solano	Putah South Canal	PSC015	1[46]
ELDID	El Dorado Hills WTP	WTPEDH	El Dorado ID	Lake Folsom	FOLSM	12[47]
FRFLD	North Bay Regional WTP	WTPNBR	City of Fairfield	North Bay Aqueduct	NBA011	8[48]
				Putah South Canal	PSC017	14[49]
	Waterman WTP	WTPWMN	City of Fairfield	Putah South Canal	PSC024	
NAPA	Edward Jamieson Canyon WTP	WTPJAC	City of Napa	North Bay Aqueduct	NBA027	15[50]
PCWA3	Alta, Monte Vista, Colfax, Applegate WTPs	None	Placer County WA (Zone 3)	Lower Boardman Canal	LBC010	1[51]
SUISN	Cement Hill WTP	WTPCMT	Suisun Solano Water Authority	Putah South Canal	PSC020	5[52]
TVAFB	Travis WTP	WTPTAB	City of Vallejo	North Bay Aqueduct	NBA009	3[53]
VLLJO	Fleming Hill WTP	WTPFMH	City of Vallejo	Putah South Canal	PSC003	19[54]
				North Bay Aqueduct	NBA021	
	Green Valley WTP	None	City of Vallejo	Putah South Canal	PSC003	[55]

Notes:

[1] The name of demand units located within a Water Budget Area (WBA) is prefixed by using the WBA identification number. Demand units located outside of the WBA domain, being located either in the rim watersheds or within the Sacramento-San Joaquin Delta or San Francisco Bay hydrologic regions, are identified using a 5-letter acronym.

[2] Historical deliveries to Centerville CSD and Clear Creek CSD are an average of 2005 – 2009 data from PWSS database.

[3] Historical deliveries data to Keswick CSA are an average of 2000 – 2004 data from Reclamation.

[4] Historical deliveries to Shasta CSD are an average of 2006 and 2007 data from PWSS database.

[5] Historical deliveries to the City of Redding are an average of 2006 – 2010 data from PWSS database and are deliveries to both of the city's water treatment plants. Delivery data for the city's Buckeye Water Treatment Plant are from Reclamation. Delivery data for the city's Foothill Water Treatment Plant from subtraction.

[6] Historical deliveries to Jones Valley CSA are "existing supplies" from Redding Basin Water Resources Management Plan Phase 2C Report (CH2M HILL, 2003).

[7] Historical deliveries to Mountain Gate CSD are an average of 2006 – 2010 data from PWSS database.

[8] Historical deliveries to Shasta Lake CSD are an average of 2006 – 2010 data from PWSS database.

[9] Historical deliveries to Bella Vista Water District are an average of calendar years 2006, 2007, 2009 and 2010 data from PWSS database.

[10] Historical deliveries to Thermalito Irrigation District are average of calendar years 2005, 2008 and 2009 data from PWSS database

[11] Historical deliveries to California Water Service Company – Oroville are an average of 2007 – 2009 from PWSS database. This figure agrees with average values reported by the agency (California Water Service Company, 2011).

[12] Historical deliveries to South Feather Water and Power Agency's Miners Ranch Water Treatment Plant are an average of 2007 – 2009 data from the agency.

Table 12-8. Surface Water Diversions for Municipal and Industrial Water Supply (contd.)

[13] Historical deliveries to Palermo Canal are an average of 2006 – 2010 from DWR and are flows at the head of the canal. South Feather Water and Power Agency report canal conveyance losses of approximately 80 percent.

[14] Historical deliveries to Bangor Canal are an average of 2005 – 2009 for flow at the head of the canal. 2005 and 2006 data from USGS, 2007 – 2009 data from South Feather Water and Power Agency. Water is for both agricultural and municipal water uses.

[15] No historical diversion data were collected for the City of Marysville. The city holds a contract with Yuba County Water Agency for a maximum water diversion of 2,500 acre-feet per year. Surface water diversion is an estimate based on water right.

[16] Historical deliveries to the City of Yuba City are an average of years 2006 – 2010 from PWSS database.

[17] The Woodland-Davis Clean Water Agency is planning to build a water treatment plant to treat water from the Sacramento River and to deliver to the Cities of Davis and Woodland and UC Davis. Water would be delivered from a new intake jointly owned and operated by the water agency and Reclamation District 2035.

[18] Historical deliveries to the City of West Sacramento are an average of 2006 – 2010 from PWSS database.

[19] Historical deliveries to Placer County Water Agency upper Zone 1 are an average of 2006 – 2010 data from PWSS database.

[20] Historical deliveries to Christian Valley CSD are for the calendar year 2009 from PWSS database.

[21] Historical deliveries to Placer County Water Agency Zone 1 are an average of 2005 – 2009 from 2010 urban water management plan. Production for retail demands for Zone 1 averages 28.2 TAF per year, production for wholesale demands to the City of Lincoln, Cal American, and other small communities average 10.3 TAF per year. Raw water sales to Christian Valley CSD are not included in these values. Deliveries of 7.2 TAF per year of 28.2 TAF are assumed to be for upper Zone1.

[22] Placer County Water Agency is currently in the design phase of the proposed Ophir Water Treatment Plant which will be located adjacent to the American River Pump Station. The Ophir Water Treatment Plant would treat a portion of the already approved 35,500 acre-foot-per-year American River supply diverted at the American River Pump Station. The new plant will provide up to 30 mgd.

[23] Historical deliveries to North Auburn are an average of 2005 – 2009 data from PWSS database.

[24] Historical deliveries to the City of Vacaville are an average of 2006 – 2010 data from PWSS database.

[25] Historical deliveries to the City of Roseville are an average of 2006, 2007, 2008, 2010 data from 2010 urban water management plan and PWSS data.

[26] Historical deliveries to San Juan Water District retail area are an average of 2005 and 2010 data from 2010 urban water management plan.

[27] Historical deliveries to San Juan Water District wholesale area includes deliveries to Citrus Heights Water District, Fair Oaks Water District, Orange Vale Water Company, and City of Folsom's Ashland service area. Delivery data for Fair Oaks Water District are an average of 2006 – 2010 data from 2010 urban water management plan (12.2 TAF/year). Delivery data for Ashland service area are an average of 2006 – 2010 data from City of Folsom urban water management plan (1.6 TAF/year). Delivery data for Citrus Heights Water District are an average of 2006 – 2010 data from urban water management plan (16.3 TAF/year). Delivery data for Orange Vale Water Company are an average of 2006 – 2010 data from urban water management plan (or (4.8 TAF/year). The amount of surface water deliveries before 2009 is uncertain as San Juan Water District discovered that their wholesale meters were inaccurate. The meters have since been replaced. For comparison, total wholesale deliveries by San Juan Water District in 2010 were 41.0 TAF.

[28] Historical deliveries to Sacramento Suburban Water District from Placer County Water Agency are an average of 2006 – 2010 data from the district's 2010 urban water management plan. This water is treated at San Juan Water District's water treatment plant and wheeled through their facilities. The value of 12.8 TAF/year includes a small amount of water delivered by the City of Sacramento from its Fairburn Water Treatment Plant.

[29] Historical deliveries to the City of Sacramento's Fairburn Water Treatment Plant are average of 2005 – 2009 data from the city (Peifer, 2011)

[30] Historical deliveries to Carmichael Water District are an average of 2006 – 2010 data from 2010 urban water management plan.

[31] Historical deliveries to the City of Folsom are an average of 2006 – 2010 data from 2010 urban water management plan. These deliveries do not include raw water deliveries to Aerojet or water delivered to the Ashland water service area. The City provides retail water service to the Ashland Area. Water customers in this area are fully reliant on wholesale water purchased by the city from San Juan Water District.

[32] Historical deliveries to Folsom Prison are an average of 2006 – 2010 data from Reclamation.

[33] Historical deliveries to Aerojet from City of Folsom (Folsom, 2011). Single average annual value reported.

[34] Historical deliveries to Golden State Water Company – Cordoba are an average of 2006 – 2010 data from 2010 urban water management plan. Calculated as total production less groundwater pumping.

[35] No historical delivery data were collected for California Department of Parks and Recreation. Value is an estimate only.

[36] Historical deliveries to the City of Sacramento's Sacramento River Water Treatment Plant are average of 2005 – 2009 data from the City (Peifer, 2011)

[37] The Vineyard Water Treatment Plant was completed by Sacramento County Water Agency in 2011. The 50 mgd plant became operational in 2012.

Table 12-8. Surface Water Diversions for Municipal and Industrial Water Supply (contd.)

[38] Historical deliveries to SMUD's Rancho Seco Power Plant are an average of 2006 – 2010 from Reclamation. Deliveries include water right water and project water. Deliveries do not include emergency allocation of project Water from SMUD to Golden State Water Company.

[39] Historical deliveries for the City of American Canyon are for 2006 – 2010 from 2010 urban water management plan and include water treated at the City of Napa and City of Vallejo water treatment plants and minor amounts of agricultural water.

[40] Historical deliveries for the City of Antioch are from 2010 urban water management plan.

[41] Historical deliveries to the City of Benicia from the North Bay Aqueduct are an average of 2006 – 2010 data and are estimated from the PWSS database. Deliveries to Benicia include operational losses associated with temporary storage in Lake Herman, and raw water supplies to the Valero refinery.

[42] Historical deliveries to the City of Benicia from the Putah South Canal are an average of 2006 – 2010 data from Reclamation for the Solano Project.

[43] Historical deliveries to Contra Costa Water District are an average of 2005 – 2009 data from DayFlow. Data does not include deliveries from the district's Mallard Slough intake.

[44] Contra Costa Water District began diversions from its Victoria Canal intake in August 2010.

[45] Historical deliveries from Clear Lake are an average of 2006 – 2010 data from Yolo County Flood Control and Water Conservation District.

[46] Historical deliveries to California State Prison – Solano are an average of 2006 – 2010 from Reclamation for the Solano Project.

[47] Historical deliveries from Folsom Lake to El Dorado Irrigation District are an average of 2006 – 2010 data from Reclamation.

[48] Historical deliveries to the City of Fairfield from 2010 urban water management plan. Historical deliveries from North Bay Aqueduct calculated as total deliveries less delivery from Putah South Canal.

[49] Historical deliveries from Putah South Canal to the City of Fairfield's North Bay Regional and Waterman water treatment plants are an average of 2006 – 2010 from PWSS database.

[50] The City of Napa exports water to the Cities of American Canyon, St. Helena, and Calistoga, and the Town of Yountville. St. Helena and Yountville are retail customers of the city. St. Helena is contractually obligated to purchase a minimum amount of City of Napa water each year. Yountville purchases are rare and minimal due to sufficient local supply sources. Calistoga and American Canyon have contractual entitlements to SWP water from the North Bay Aqueduct. The City treats their water at Jamieson Canyon Water Treatment Plant and wheels the treated water. Historical delivery data are an average of calendar years 2006 – 2010 from urban water management plan. This delivery excludes water that is treated and wheeled to American Canyon and Calistoga. However, the delivery does include local water supplies from Hennessy and Milliken reservoirs. Average supplies from these local sources are approximately 18,200 acre-feet per year.

[51] Historical deliveries to Placer County Water Agency's Zone 3 are an average of 2005 – 2009 data from 2010 urban water management plan.

[52] The Suisun Solano Water Authority is a Joint Point Authority (JPA) between the City of Suisun and Solano Irrigation District. Historical delivery data are an average of 2006 – 2010 data from PWSS database.

[53] No historical delivery data were collected for Travis Air Force Base. The City of Vallejo, which acts as a wholesaler, reports the 2005 demand to be 3,400 acre-feet in the City's 2005 urban water management plan.

[54] Historical deliveries to the City of Vallejo are an average of 2006 – 2010 data from PWSS for Fleming Hill Water Treatment Plant. Delivery data does not include deliveries to the Green Valley water treatment plant that serves the Vallejo Lakes system.

[55] No historical delivery data was collected for the Green Valley Water Treatment Plant as part of this study. Deliveries are small. The treatment plant has a capacity of 1.0 mgd and receives water from local sources in addition to Putah South Canal.

Key:

Cal-Water SC = California Water Service Company

CSA = Community Service Agency

CSD = Community Service District

ID = Irrigation District

TAF = thousand acre-feet

WA = Water Agency

WC = Water Company

WD = Water District

WTP = Water Treatment Plant

Table 12-9. Conjunctive Use of Surface Water and Groundwater

Demand Unit	Cities, Towns, and Communities	Retail Water District or Agency (Wholesale Water District or Agency)	Minimum Groundwater Pumping Fraction
02_SU	Redding[1]	City of Redding (CVP)	0.30
03_SU	Redding[1]	City of Redding (CVP)	0.30
03_PU1	Shasta CSA No. 6[2]	Jones Valley CSA, Shasta WA (CVP)	0.00
	Shasta Lake[2]	Shasta Lake CSD (CVP)	0.00
	Mountain Gate[2]	Mountain Gate CSD (CVP)	0.00
03_PU2	Stillwater Valley, Bella Vista, Palo Cedro, Redding (part)[2]	Bella Vista WD (CVP)	0.00
03_PU3	Redding (part)[1]	City of Redding (CVP)	0.00
12_NU1	Oroville[3]	Cal-Water SC - Oroville	0.25
13_NU2	Small communities[2]	South Feather Water & Power Agency	0.00
16_PU	Yuba City[4]	City of Yuba City (SWP)	0.00
24_NU1	Auburn, Bowman[5]	Placer County WA - Upper Zone 1	0.00
	Christian Valley Park[5]	Christian Valley Park CSD (Placer County WA)	0.00
24_NU2	Loomis, Penryn, Rocklin, Granite Bay (part), City of Roseville (part)[5]	Placer County WA - Lower Zone 1	0.00
	City of Lincoln[6]	City of Lincoln (Placer County WA, Nevada ID)	0.05
25_PU	Vacaville[7]	City of Vacaville	0.25
26N_PU1	City of Roseville[8]	City of Roseville (CVP)	0.00
26N_PU3	Orange Vale[9]	Orange Vale WC (San Juan WD)	0.00
	City of Citrus Heights[10]	Citrus Heights WD (San Juan WD)	0.05
	Fair Oaks[11]	Fair Oaks WD (San Juan WD)	0.02
	City of Folsom – Ashland[12]	City of Folsom (San Juan WD)	0.00
26N_NU1	Northridge, North Highlands[13]	Sacramento Suburban WD – NSA (San Juan WD, City of Sacramento)	0.20
	Antelope, Lincoln Oaks[14]	Cal-Am WC (San Juan WD)	0.90
	Rio Linda, Elverta (part)[15]	Rio Linda Elverta CWD (San Juan WD)	0.60
26N_NU2	Carmichael[16]	Carmichael WD	0.15
26N_NU3	City of Sacramento North[17]	City of Sacramento Utilities	0.15
26N_NU4	Arcade - Town and Country[13]	Sacramento Suburban WD - SSA (City of Sacramento)	0.20
26S_PU1	City of Folsom[18]	City of Folsom (CVP)	0.00
26S_PU2	Rancho Cordova[19]	Golden State WC (CVP)	0.50
26S_PU4	Laguna[20]	SCWA – SSA (Zone 40)	0.00
26S_PU5	City of Elk Grove (part)[21]	Elk Grove WD – Tariff Area No.2 (SCWA)	0.00
	City of Elk Grove (part)[21]	Elk Grove WD – Tariff Area No.1	1.00
26S_PU6	Vineyard[20]	SCWA Zone 41 - CSA (Zone 40)	0.00
	Mather-Sunrise[20]	SCWA Zone 41 - NSA (Zone 40)	0.00
	Sunrise/Security Park[20]	Cal-Am WC (Zone 40)	0.90
26S_NU1	City of Sacramento South[17]	City of Sacramento Utilities	0.00
26S_NU2	Parkway, Suburban, Rosemont[14]	Cal-Am WC (City of Sacramento)	0.90
26S_NU4	Groundwater remediation[2]	Aerojet	

Table 12-9. Conjunctive Use of Surface Water and Groundwater (contd.)

Notes:

[1] The City of Redding primarily uses groundwater to supplement surface water production during periods of high water demand in summer months. Current well production is approximately 7,500-10,000 acre-feet per year. Well capacity is approximately 18,500 acre-feet per year (Redding, 2011). Approximately 94 percent of well capacity is located in the Enterprise Pressure Zone in demand unit 03_SU. The Buckeye and Hilltop pressure zones that comprise demand unit 03_PU3 do not have access to groundwater. Although demand unit 03_PU3 has no access to groundwater, CalSim 3.0 may simulate groundwater pumping as the model currently does not have the flexibility to redirect water supplies from the Foothill Water Treatment Plant which serves demand units 02_SU and 03_SU.

[2] No data for historical groundwater pumping were collected as part of this study.

[3] California Water Service Company – Oroville operates 4 wells with a capacity of approximately 4,600 acre-feet per year to supplement surface water supplies. Over the last 5 years, groundwater has provided between 10 and 40 percent of total supply (California Water Service Company, 2011)

[4] The City of Yuba City maintains one standby groundwater well at the City's water treatment plant, which has a capacity of approximately 3,200 acre-feet per year, for emergency purposes only (Yuba City, 2011).

[5] Placer County Water Agency may in the future pump groundwater to meet M&I demands under dry hydrologic conditions (PCWA, 2011).

[6] The City of Lincoln pumps approximately 1,000 acre-feet per year of groundwater. The city's goal is to use groundwater to meet no more than 10 percent of its water demands during normal years (Lincoln, 2011).

[7] The City of Vacaville currently pumps approximately 5,000 acre-feet per year of groundwater from 12 wells. Groundwater accounts for 26 percent to 38 percent of total supply depending on surface water availability (Vacaville, 2011).

[8] The City of Roseville currently operates five groundwater wells, which have a capacity of approximately 12,000 acre-feet per year. The groundwater wells are for backup water supply and to improve water supply reliability during drought and emergency conditions. The city is in process of developing an Aquifer Storage and Recovery (ASR) program that would allow storage of surplus surface water in underground aquifers injected through these production wells (Roseville, 2011).

[9] Orange Vale Water Company maintains one groundwater well as an emergency supply. The well has a capacity of approximately 1,600 acre-feet per year and could be used to supplement supplies when surface water is limited. The company did not use any groundwater from 2006 to 2010 (OVWC, 2011).

[10] Citrus Heights Water District operates 5 wells to supplement surface water supplies. The wells have a capacity equivalent to approximately 2,500 acre-feet per year. Over the last 5 years, groundwater use has varied from less than 1 percent of total supply to 16 percent of supply. The district has agreements with San Juan Water District, the wholesaler, and other retailers, so that the "San Juan Family" as a group can respond to surface water shortages by providing groundwater to the system and moving supplies to those retailers with limited or no groundwater (CHWD, 2011).

[11] Fair Oaks Water District Seven operates 7 groundwater wells to supplement surface water supplies for emergency situations and to meet peak demands. Currently, groundwater meets approximately 2 percent of the district's water demands (FOWD, 2011).

[12] San Juan Water District is a wholesaler for the Ashland area within the City of Folsom. The district only delivers surface water. No groundwater is used within Ashland (SJWD, 2011).

[13] Sacramento Suburban Water District has a total groundwater pumping capacity of 159,000 acre-feet per year from 89 active wells. Groundwater has historically been the primary source of water for both the NSA and SSA, but groundwater use in the NSA has significantly declined since 1998 and has been reduced in the SSA since 2007 because of greater availability of surface water (SSWD, 2011). The district has established a long-term groundwater pumping target of 35,000 acre-feet per year (SSWD, 2011).

[14] Water sources available to California American Water Company include groundwater and wholesale purchases, which are a mix of surface water and groundwater (CalAm, 2011).

[15] Rio Linda Elverta Community Water District has traditionally met its demand entirely from groundwater. However, groundwater use is projected to diminish o 60 percent of supplies as surface water is made available from Sacramento Suburban Water District (RLECWD, 2011).

[16] Carmichael Water District uses surface water supplies in lieu of groundwater where possible to protect its groundwater supplies for future use (CWD, 2011).

[17] The City of Sacramento currently operates 27 wells; 25 of which are located north of the American River, and 2 are located south of the American River. Fourteen additional wells are used to meet irrigation demands in city parks. Over the last 5 years, groundwater has provided from 15 to 19 percent of total supply (Sacramento, 2011).

[18] The City of Folsom currently uses groundwater for irrigation of one golf course, but does not currently pump groundwater for use in its service area, and has not pumped groundwater in the past 5 years (Folsom, 2011).

Table 12-9. Conjunctive Use of Surface Water and Groundwater (contd.)

Notes:

[19] Regional groundwater contamination has reduced available high quality groundwater to Golden State WC. As a result of litigation, Aerojet and Golden State WC signed a settlement agreement in 2004 which obligates Aerojet to supply Golden State WC with 5,000 acre-feet per year of replacement water to offset contaminated groundwater as well as an additional 10,200 acre-feet per year of contingent replacement water if necessary to satisfy system demands.

[20] Sacramento County Water Agency has used groundwater to meet between 85 percent and 95 percent of demand. However, the completion of the Freeport Regional Water Project and Vineyard Water Treatment Plant will result in significant increases in surface water use (SCWA, 2011).

[21] The City of Elk Grove is comprised of two service areas referred to as Tariff Area No. 1 and Tariff Area No. 2. Tariff Area No. 1 is supplied by 7 groundwater wells, Tariff Area No. 2 receives wholesale water from Sacramento County Water Agency, which is a mix of surface water and groundwater. Locally produced groundwater accounts for approximately 60 percent of supplies to the combined service areas (EGWD, 2011).

Key:
Cal-Am WC = California American Water Company
Cal-Water SC = California Water Service Company
CSA = Central Service Area
CSD = Community Service District
CVP = Central Valley Project
CWD = Community Water District
ID = Irrigation District
NSA = North Service Area
SCWA = Sacramento County Water Agency
SSA = South Service Area
SWP = State Water Project
WA = Water Agency
WC = Water Company
WD = Water District
WSC = Water Service Company

Return Flows

CalSim 3.0 defines wastewater return flows for each urban demand unit. Treated wastewater from large urban centers, with dedicated or regional wastewater treatment plants, may be discharged to surface waters. However, in most rural areas and smaller towns, wastewater typically is discharged to private septic systems or evaporation ponds, which recharge the underlying groundwater aquifer.

Some towns and cities in California have combined sewer systems, which provide both sewage and drainage services. In a “combined system,” such as the older part of the City of Sacramento, both stormwater and wastewater are collected and conveyed in a single piped system. In a “separated system,” sanitary sewers are constructed to collect wastewater and a storm drain system constructed to convey stormwater runoff. Separated systems are typically designed for both dry weather flows and wet weather flows. Although not intended to convey stormwater flows, a small amount of rainfall (about 1 percent) infiltrates into the sewer system. In CalSim 3.0, stormwater runoff and treated wastewater from M&I water use are represented and modeled separately, although in reality, these flows may mix at a wastewater treatment plant and jointly discharge to the stream system.

Indoor and Outdoor Water Use

For CalSim 3.0, urban water use is divided into indoor and outdoor components. It is assumed that indoor water use is constant throughout the year and equal to the water production for the

month of lowest water use. The relative split between indoor and outdoor water use varies from month to month because outdoor water use typically peaks in mid-summer. CalSim 3.0 assumes that all indoor water use returns to either the surface water or groundwater system, i.e. there are no evaporative losses. In contrast, part of outdoor urban water is used consumptively through irrigation and ET. One-dimensional simulation of outdoor water use (in a manner similar to agricultural water use) requires information on the area of irrigated landscape. To avoid these data requirements, a very simple representation is used in CalSim 3.0; it is assumed that 20 percent of outdoor water use percolates to the groundwater system, and that there is no surface return flow.

Wastewater

The monthly volume of wastewater modeled in CalSim 3.0 is determined based on historical production data and two assumptions: (1) wastewater discharge is constant throughout the year; and (2) discharge is equal to the month of minimum water use. Wastewater treatment plants that discharge to surface waters of the Sacramento Valley were identified from the NPDES permits database (EPA, 2016). Within the Sacramento Valley, many wastewater treatment plants discharge to the Sacramento River or its tributaries. Additionally, two wastewater treatment plants discharge to the San Joaquin River in the Delta, and two plants discharge to the Old River. Wastewater treatment plants discharging to surface waters are listed in Table 12-11, together with their discharge permit capacity and average dry weather discharge rate (where available). For the major wastewater treatment plants (e.g., Sacramento Regional Wastewater Treatment Plant), discharges calculated based on the month of minimum use were compared to historical data. Return flow loss factors were introduced in the model to better match historical surface water discharge data and to represent treated wastewater that is disposed through evaporation and/or percolation to groundwater. As a simplification, all losses are returned to the groundwater system.

Model Validation

Urban demands are based on historical municipal production data for public water agencies and estimates of population and per capita water use for self-supplied water users. The ability to validate simulated M&I water use in CalSim 3.0 through comparison to observed data is limited as simulated deliveries are derived from these historical data, where data are available. However, comparisons were made for water agencies (demand units) located in the Sacramento Valley that conjunctively manage surface water and groundwater supplies to test whether CalSim 3.0 is representing these operations correctly. From 2005 through 2009, historical surface water diversions for these agencies average approximately 330,000 acre-feet per year. Simulated surface water diversions for the same period average 320,000 acre-feet per year.

Table 12-10. Wastewater Discharge to Surface Waters

Wastewater Treatment Facility				Surface Water Discharge			
Facility	**CalSim 3.0 Node**	**Operator**	**Treated Wastewater (mgd)[1]**	**Receiving Waters**	**CalSim 3.0 Node**	**Permit Capacity (mgd)[2]**	**Fraction of Wastewater Discharged[3]**
Anderson WPCP	None[5]	City of Anderson	1.4	Sacramento River	SAC281	2.0	100%
Auburn WWTP	None[5]	City of Auburn	-	Auburn Ravine	ABN027	1.7	100%
Beale Air Force Base[6]	None[5]	U.S. Air Force	-	Hutchinson Creek	DHC001	5.0	100%
Biggs WWTP	Not modeled[4]	City of Biggs	0.3	Lateral K, RD 833	Not modeled	0.4	0%
Chico WPCP	CHWWTP	City of Chico	7.0	Sacramento River	SAC195	9.0	100%
Clear Creek WWTP	CCWWTP	City of Redding	9.6	Sacramento River	SAC287	8.8	100%
Colfax WWTP	Not modeled[4]	City of Colfax	0.2	Smuthers Ravine	Not modeled	0.3	100%
Colusa WWTP	Not modeled[4]	City of Colusa	0.6	Colusa Trough	Not modeled	0.5	0%
Combined WWTP[7]	Not modeled[4]	City of Sacramento	-	Sacramento River	Not modeled	130.0	0%
Corning WWTP	None[5]	City of Corning	-	Sacramento River	SAC217	1.4	100%
Cottonwood WWTP	None[5]	Shasta CSA #17	0.3	Cottonwood Creek	SAC281	0.4	100%
Davis WWTP	DVWWTP	City of Davis	5.3	Willow Slough Bypass	WSB000	7.5	100%
Deer Creek WWTF	DCWWTP	El Dorado ID	2.9	Deer Creek	DEE020	2.5	100%
Dry Creek WWTP	DCWWTP	City of Roseville	10.0	Dry Creek	DCK012	18.0	100%
Easterly WWTP	EAWWTP	City of Vacaville	14.9	Alamo Creek	CSL005	6.9	100%
El Dorado Hills WWTF	DCWWTP	El Dorado ID	2.9	Carson Creek	DEE020	4.0	100%
Galt WTF	WSWWTP	Galt SD	2.2	Laguna Creek	SJR028	3.0	100%
Lake California WWTP	None[5]	Rio Alto WD	0.2	Sacramento River	SAC281	0.6	100%
Lincoln WWTP	PGWWTP	City of Lincoln	2.8	Auburn Ravine	CRC002	1.4	100%
Linda WWTP	LCWWTP	Linda WD	1.3	Feather River	FTR025	6.7	100%
Live Oaks WWTP	Not modeled[4]	City of Live Oaks	-	Sutter Bypass	Not modeled	1.4	0%
Maxwell WTF	Not modeled[4]	Maxwell PUD	-	Lurline Creek	Not modeled	0.2	0%

Table 12-10. Wastewater Discharge to Surface Waters (contd.)

Wastewater Treatment Facility				Surface Water Discharge			
Facility	**CalSim 3.0 Node**	**Operator**	**Treated Wastewater (mgd)[1]**	**Receiving Waters**	**CalSim 3.0 Node**	**Permit Capacity (mgd)[2]**	**Fraction of Wastewater Discharged[3]**
Mineral WWTP	Not modeled[4]	Tehama SD #1	-	Battle Creek	Not modeled	0.8	0%
Mountain House WWTP	TCWWTP	Mountain House CSD	—	Old River	OMR039	5.4	100%
Olivehurst WWTP	None[5]	Olivehurst PUD	—	Bear River	DHC001	3.0	100%
Oroville WWTP	ORWWTP	Sewage Commission Oroville Region	3.0	Feather River	FTR063	6.5	100%
Placer Co DFS	Not modeled[4]	Placer SMD #3	—	Miners Ravine	Not modeled	0.3	100%
Placer Co SMD1 WWTP	None[5]	Placer SMD #1	1.7	Rock Creek	CCK038	2.2	100%
Pleasant Grove WWTP	PGWWTP	City of Roseville	7.0	Pleasant Grove Creek	CRC002	12.0	100%
Red Bluff WWTP	None[5]	City of Red Bluff	1.4	Sacramento River	SAC240	2.5	100%
Rio Vista WTF	Not modeled[4]	City of Rio Vista	0.4	Sacramento River	Not modeled	0.4	0%
Sacramento Regional WWTP	SRWWTP	Sacramento Regional SD	142.2	Sacramento River	SAC048	181.0	100%
Shasta Lake WWTP	None[5]	City of Shasta Lake	0.9	Churn Creek[8]	KSWCK	1.3	100%
Stillwater Regional WWTP	SWWWTP	City of Redding	4.0	Sacramento River	SAC281	4.0	100%
Williams WWTP	Not modeled[4]	City of Williams	—	Salt Creek	Not modeled	0.5	0%
Willows WWTP	None[5]	City of Willows	—	Drain Ditch	CBD049	1.1	100%
Woodland WPCF	WLWWTP	City of Woodland	5.6	Tule Canal	YBP032	7.8	100%
Yuba City WWTP	YCWWTP	City of Yuba City	8.9	Feather River	FTR028	10.5	75%

Table 12-10. Wastewater Discharge to Surface Waters (contd.)

Notes:

[1] Estimated dry weather flow for 2010. Values were obtained from 2010 urban water management plans, wastewater system master plans, and other sources. "–" indicates that no historical data were collected as part of the CalSim Hydrology Development Project. 1 mgd is equivalent to 1,120 acre-feet per year.

[2] Source: Permit Compliance System (PCS) database, a computerized management information system which contains data on National Pollutant Discharge Elimination System (NPDES) permit-holding facilities: http://oaspub.epa.gov/enviro/ef_home2.water.

[3] The fraction of treated water that is discharged to surface water is assumed equal to 100 percent unless specific information (including reuse) is published in 2010 urban water management plans. For modeling purposes, treated wastewater not discharged to surface waters is assumed to percolate to groundwater.

[4] Where wastewater treatment plants are not modeled in CalSim 3.0, wastewater is assumed to return to the groundwater system.

[5] Wastewater treatment plants that have a capacity of less than 5.0 mgd, or that do not discharge to surface waters, are typically not represented explicitly in the CalSim 3.0 schematic.

[6] Beale Air Force Base is located in CalSim 3.0's rim watershed upstream from WBA 15S.

[7] The Combined Wastewater Treatment Plant in the City of Sacramento is only operated during heavy rainfall events. The normal operation is to convey wastewater to the Sacramento Regional Wastewater Treatment Plant.

[8] The Shasta Lake Wastewater Treatment Plant discharge to Churn Creek is from October 16 through April 14.

Key:

CSA = County Service Area
CSD = Community Services District
ID = Irrigation District
mgd = million gallons per day
PUD = Public Utility District
RD = Reclamation District
RWCF = Regional Wastewater Control Facility
SD = Sanitation District
SMD = Sewer Maintenance District
WD = Water District
WPCF/P = Water Pollution Control Facility/Plant
WQCF = Water Quality Control Facility
WTF = Water Treatment Facility
WWTF/P = Wastewater Treatment Facility/Plant